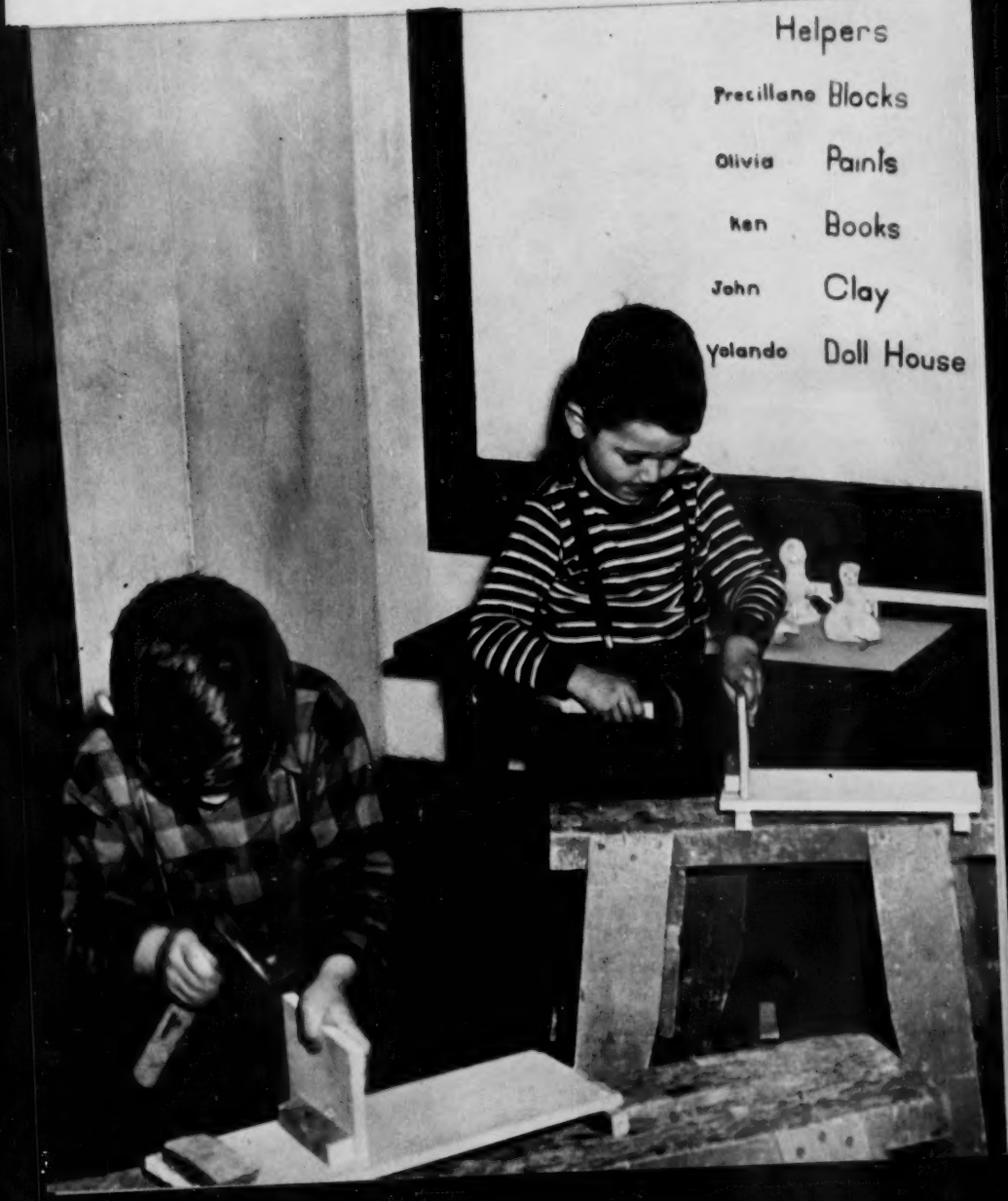
CALIFORNIA SCHOOLS

OCTOBER, 1962



CALIFORNIA SCHOOLS

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THE COVER PICTURE shows elementary school pupils participating in industrial arts activities in the Los Angeles Unified School District.

The Bureau of Secondary Education with the support of the Bureau of National Defense Education Act Administration brought together at Los Angeles, April 15-17, 1962, the directors of education of the American Chemical Society, the American Institute of Biological Sciences, the American Institute of Physics, and the American Association for the Advancement of Science to suggest procedures whereby the Bureau may assist the junior, senior, and four-year high schools of California in improving science instruction. It must be understood that these men do not speak officially for their respective societies. Their consensus statement combines only their individual opinions. Each has had unusual opportunity, however, to gain acquaintance with a variety of science programs in schools throughout the nation and to discuss problems of science education with many scientists and school teachers.

For two days the members of the group talked among themselves and with several members of the Division of Instruction. It is interesting in passing to note that this was the first occasion the four had had to discuss mutual problems with one another. On the third day they met informally with representative scientists invited from California colleges and universities and presented their preliminary suggestions. This report attempts to embody the criticisms obtained from their California colleagues. It is, as John Mayor says, "a protodocument that should be discussed, amended, and finally published by the State Science and Mathematics Advisory Committee proposed in this report." State Superintendent of Public Instruction Roy E. Simpson has issued invitations to representatives of California colleges and universities as well as public education to carry forward its suggestions.

FRANK B. LINDSAY, *Chief*
Bureau of Secondary Education

SUGGESTIONS FOR THE IMPROVEMENT OF SCIENCE INSTRUCTION IN CALIFORNIA SECONDARY SCHOOLS, GRADES NINE THROUGH TWELVE

Prepared by JOHN R. MAYOR, ROBERT E. HENZE, WILLIAM C. KELLY, and GAIRDNER B. MOMENT

The Bureau of Secondary Education of the State Department of Education of California invited four science consultants to work with a number of scientists in California on a program to improve science instruction in California in grades nine through twelve. The consultants met with members of the staff of the Bureau of Secondary Education on April 15 and 16, and with a group of some 20 scientists and science educators from California colleges and universities on April 17, 1962.

The consultants prepared, during their two-day conference with State Department personnel, a set of suggestions for discussion at the larger meeting on the third day. The larger group endorsed the recommendation of the consultants for the establishment of a State Science and Mathematics Advisory Committee. A primary purpose of the Com-

mittee would be to continue the study of suggestions of the April conferences and of new problems related to science instruction as they arise. The consultants believe that consideration by one group of the problems of science and mathematics instruction would be of advantage to both disciplines. Hence, in this report, science instruction is intended to include mathematics instruction.

The consultants from out-of-state were asked to consider both broad and specific problems related to the improvement of science instruction in grades nine through twelve in the California schools. After exploratory consideration, the ideas of the visitors appeared to crystallize under the headings which were used in the report to the larger group. This report will be organized under the same headings.

In general, the suggestions of this report were made by the visitors to California. Differences of opinion brought out in the larger conference of scientists will be noted. The term "California scientists" is used to refer to the participants in the April 17 discussions who came from California colleges and universities. This report on science instruction in California high schools must be regarded only as a first step. There are suggested in the report a great many things to be done. In the process of developing a program for improvement of science instruction, much information will be obtained which, if it had been available to the consultants and the larger group of discussants, almost certainly would have modified a number of the suggestions and points of view.

The out-of-state consultants were fully aware of their own limitations and the limitations of any report which could be produced by a group, no matter how competent, in three days. Although each consultant is associated with a major scientific society, he could in no way speak for his society. Whatever suggestions the consultants made were made by them as individuals and in this report as a group of individuals in consensus. Whatever competence the consultants have is based on what they have learned from meeting with scientists and teachers of science throughout the country to discuss similar problems and through experience with the science education programs of their societies.

The consultants who helped prepare this document consider it a contribution toward a report on the problem of mathematics and science teaching in California high schools—a "protodocument" that should be discussed, amended, and finally published by the State Science and Mathematics Advisory Committee proposed in this report. There is no objection to the publication of an early preliminary report, if that seems desirable, if those who read the report fully recognize the limitations of it and the spirit in which it is presented.

Philosophy

Science courses in grades nine through twelve should contain a judicious combination of breadth and depth, covering the interrelation

of the intellectual and utilitarian aspects of science. Whenever possible in teaching science an evidential rather than a dogmatic approach should be used. Many science courses of the past 25 years have emphasized utilitarian aspects of science, and the dogmatic approach has often had a prominent place in the teaching.

The newer courses in science are being developed in such a way as to reveal the intellectual aspects of the science and to include some of the utilitarian aspects. Both the intellectual and the utilitarian serve as motivation for the study of science and as a basis for the scientific literacy greatly needed by all citizens. The interrelations between theoretical knowledge and its practical fruits must be made clear. Recognition of the interaction between theory and practice and between theory and experiment is basic in understanding the processes of science. Study of modern science should make clear that no basic cleavages separate the sciences, nor separate pure from useful knowledge.

The new courses in both science and mathematics attempt to provide evidence for conclusions. In many instances the evidence is introduced through the so-called "discovery approach." It is recognized, however, that in both science and mathematics at the secondary school level there will be certain topics for which the evidential approach should not be solely relied upon, even though the topics are appropriate for study at this level.

Basic Requirements

In view of the present and future place of science in modern society and the need for scientific background for technological and other specialized occupations, it is recommended that all students of California high schools be required in grades nine through twelve to complete three years of mathematics and three years of science, including biology, chemistry, and physics, not necessarily in separate courses. It is further recommended that some attention be given in the mathematics sequence to simple probability and statistics.

Multitrack Programs

Mathematics. In order to provide the best possible experiences in mathematics for all high school students it will be necessary to offer mathematics in two or three tracks, according to the abilities, interests, and previous experiences of the students. Suggestions for the organization of these tracks follow:

Track 1:

Four years, starting with first-year algebra based on the newer mathematics, and with the fourth year including substantial work in the calculus

There is sufficient material now recommended by several of the mathematics curriculum groups, including the School Mathematics

Study Group, for a four-year sequence, including a year of elementary mathematical analysis with an introduction to calculus, a semester of probability and statistics, and a semester of linear algebra. The students who have completed first-year algebra in the eighth grade may take the advanced placement course in the senior year.

Track 2:

Three years, taking the first three years of the newer mathematics at a slower pace with somewhat less emphasis on theoretical aspects than in Track 1, and with some of the Track 1 topics omitted

Track 3:

Three years, spreading the first two years of the newer mathematics over a three-year period, including some work in simple probability and statistics

Science. The recommendations for the three-year sequence in science provide for two basic tracks. Track one, which is for college-capable students, is divided into two parts, A and B. The A division provides four years of science for individuals who plan to attend college and specialize in science and engineering; the B division provides a basic science program for individuals who plan to attend college but do not intend to specialize in either science or engineering. The two tracks recommended are outlined as follows:

Track 1:

A. Four years, taking biology in grade nine, chemistry in grade ten, and physics in grade eleven. The fourth year course might be a seminar course in science, special science projects, a course in engineering problems, or an "advanced placement course." It is recommended that no student take the fourth year of science at the expense of the fourth year of English or mathematics.

B. Three years, taking biology, chemistry and physics. It is not necessarily recommended that this group of courses be started in grade nine. The courses, generally the same as those for Track 1, may be given at a somewhat slower pace. If ability grouping by sections is possible, this distinction could be made by grouping students in appropriate sections.

Track 2:

Three years, taking biology, chemistry, physics; or one year biology; two years, chemistry-physics (integrated course).

It was recognized by the consultants and further emphasized in the conference with the California scientists that certain problems are encountered in offering biology in the ninth grade that in large part are

caused by differences in laboratory facilities and teacher preparation in junior and senior high schools. Where well-qualified teachers and well-equipped laboratories are available the consultants would recommend strongly that biology be offered in the ninth grade. In other cases, appropriate adjustments would be necessary.

Track 2 courses will be different but not radically so from those in Track 1. Experience in mathematics has shown that the students in the lower half of the classes do better with the new mathematics if it is offered at a slower pace than traditional mathematics. It is strongly recommended by the consultants that schools with qualified staffs be guided into experimental studies of special courses for the Track 2 group. It should be noted that a chemistry-physics course rather than a physical science course was proposed, since many of the present physical science courses are merely survey courses and would not meet the present need.

The tracks recommended in science are to follow seventh grade study of biological sciences based on physiology and health, and eighth grade earth sciences, including some simple physics and chemistry.

Recently, biology courses have been developed with greater emphasis on molecular biology than has previously been given in such courses. As a result of this development more of the meat of organ physiology and the facts of animal and plant structure and diversity can and should be taught in the science courses offered in grades seven, eight, and nine. This material is both basic and important and it is more susceptible than molecular material to thoroughgoing and rigorous proof by junior high school students.

A considerable part of the discussion with California scientists was devoted to the desirability of emphasis on the interdisciplinary aspects of science, particularly for Track 2 science courses. Questions were also raised about the proposed sequence of biology, chemistry, and physics. Careful experimentation is needed. One suggested innovation was a sequence of one semester of physics, one semester of biology, a second semester of physics, a first semester of chemistry, a second semester of biology, and finally a second semester of chemistry. Two semesters could be allowed for any step in the sequence if needed.

In discussions on the fourth-year courses in science, the chemists expressed doubt about the value of these courses, pointing out that they are often merely survey courses, and that the so-called "research courses" often are poorly oriented.

It was emphasized that if there was to be experimentation with courses in science rather than with courses in the separate disciplines, great care must be taken to prevent these courses from becoming watered down. There seemed to be a consensus that none of the courses in science should be considered terminal. Concern was expressed about the omis-

sion from the newer courses in science of some material of a utilitarian nature, and it was proposed that this material be introduced into seventh and eighth grade courses. The desirability of emphasizing the humanistic aspects of science in both disciplinary and integrated courses in science was pointed out. One consultant reported that a new course in physics or physical science with emphasis on the historical and philosophical aspects from a humanistic point of view was soon to be undertaken by a national group.

Laboratory Work and Demonstrations: Access to Scientific Phenomena and Methods

The consultants recognized and the participants in the conference with the California scientists underscored the importance of laboratory work in science and the desirability of providing laboratory experiments that would be superior to those traditionally in use in most high schools. An ideal program would involve seven hours per week for a science course in which there would at least be two double periods. It was recommended that schools move as rapidly as possible in Track 1 courses to a six-hour per week schedule for science courses with at least one double period.

In the original recommendation of the consultants it was proposed, largely in recognition of the difficulty of scheduling and the shortage of adequately equipped laboratories, that less time in the laboratory might be given in the Track 2 courses. However, the California scientists were generally of the opinion that even more time should be given to laboratory work in Track 2 courses than in Track 1. The consultants had no quarrel with this, but they did not want the improvement of current science courses held up by too rigid a recommendation for laboratory work in Track 2. It was agreed that goals on laboratory time should be reached with reasonable speed, and that experimentation with different ways of providing such time should be encouraged, particularly for Track 2 laboratory experiences.

It was further recommended that each science teacher devote the equivalent of one hour per week to demonstrations. While the laboratory work is important, some aspects of science can be developed through demonstrations. The quality of the laboratory and the experiences provided in it are more important than the amount of time spent. Assistance should be provided to the teachers in devising demonstrations and experiments, and new experiments should be introduced every few years. The importance of field trips in biology cannot be overemphasized, and these trips should be considered a part of the laboratory experience.

Experiments which can be performed by the students will always be the heart and soul of a science course, but at the same time some of the

new teaching aids have great possibilities. Some of the new films, which illustrate experiments that not even the best teachers working in the best-equipped laboratories can duplicate, are worthy of special attention. Teachers need help in identifying such films and in using them most effectively.

State Science and Mathematics Advisory Committee

It is recommended that a State Science and Mathematics Advisory Committee be established whose basic purpose would be to provide an opportunity for scientists and teachers in California, working with the State Department of Education, to develop school programs that will represent the best in science and mathematics. Current efforts, which will be continued, have brought about effective teamwork between scientists and teachers. This teamwork can be strengthened if representative state groups, including both scientists and teachers, organize a program on which they can work together.

The Committee should probably have no more than 15 or 20 members to be most effective, and it should be broadly representative of science and mathematics at various levels of instruction. The Committee should also include representatives from industry who have an interest in education. Since Committee members would likely be very busy people, the work of the Committee would have to be carried on by a staff of regional consultants from the colleges, universities, and industry, as well as consultants for the Committee attached to the State Department of Education.

The plan which has been used effectively in California—bringing consultants from other states to work with state committees—should also be extended to the work of this Committee. The Committee should assume broad responsibilities, and since some of these responsibilities involve very complicated problems, it may be desirable for the Committee to work through advisory subcommittees on evaluation, development of new programs, approval of programs, and encouragement and observation of experimentation.

It is recommended that the Committee be appointed by the State Superintendent of Public Instruction and be responsible to the State Department of Education. This will provide close working relationships between the recognized agency for leadership in education within the state and the teacher and lay Committee members. In other states where similar agencies have been established without association with state departments of education, some undesirable conflicts have arisen. The consultants have complete confidence that a cooperative relationship could be developed between such a Committee and the State Department of Education in California.

The following responsibilities for a State Science and Mathematics Advisory Committee are proposed:

1. The great interest in new programs in science and mathematics in California schools will necessitate evaluations of present programs and experiences with new programs. Successes and failures in one county can provide information which will be exceedingly helpful to other counties. Communication among the school systems about programs and experiences should be provided for.

2. It is recommended that widely recognized course content studies in science and mathematics be used as a source of sample materials from which schools can develop their own programs. Guidelines for state approval of programs in mathematics and science would assist school systems in avoiding undesirable variations and extreme points of view.

3. A number of publications are needed for both pupils and teachers in science and mathematics. Some of these should relate to California problems or geography in particular; others could be useful in other states as well as California. State supplements to materials prepared on a national basis will become an increasing need. The Committee could well identify these needs, find persons who could prepare the materials, and encourage the publication of such materials.

4. One of the benefits from the new programs in science and mathematics has arisen from the encouragement of experimentation within the schools. However, for experimentation to be effective, it must be guided and supervised. It can be made more effective if some state agency will encourage experimentation of different types and bring the results together for common use. Experimentation with courses for differing ability levels, and the preparation of experimental materials for those who do not appear to be college-capable are greatly needed and extremely important.

5. There are many ways to improve science instruction through adjustments in administrative plans, such as providing for longer periods of service with regular intervals of study for teachers, rewards for competent teachers, flexibility of class schedules, and the employment of consultants.

6. There is great need for improved science teaching facilities in many schools, particularly in junior high schools. Evaluation of available facilities, information on sources of facilities, and experimentation with different types of facilities can be very useful.

7. Serious consideration should be given by the Committee to the development of public understanding of science education in the schools to encourage support for improved science education programs. Many of the ideas that the Committee will suggest will probably require

additional financial support for the schools as well as for the Committee activities.

The role of state consultants of mathematics and science and how it might be related to the work of the Committee was discussed with California scientists. The consultants made no recommendation on the appointment of state science and mathematics consultants to the staff of the California State Deparment of Education. However, they did recognize that full-time staff members to serve the Committee might possibly be designated as state science consultants. Both in the discussions with California scientists and in the consultants' own discussions it was pointed out that leadership would be provided by the Committee working with and under the auspices of the California State Department of Education, and that it might not be desirable to have science consultants independent of the program of the Committee. If staff members of the Committee were also designated as state science and mathematics consultants, it might possibly be easier to recruit competent personnel.

Articulation

The Committee can become a major agency in promoting articulation in the development of programs in science and mathematics. However, the importance of articulation is so great that it is believed worthwhile to consider articulation as a separate item. Full attention should be given to the development of a well-planned sequence in science from kindergarten through grade twelve, and through the junior college and the university. California is fortunate in having a number of articulation committees already in existence. These committees working in cooperation with the State Committee can be extremely effective and helpful. A major responsibility for articulation of science programs and for improvement of instruction at the several levels rests with the State Department of Education through its various bureaus.

One of the most effective ways that a school system can promote articulation is through the appointment of a science consultant and a mathematics consultant who have responsibility for kindergarten through grade twelve, and in cases of systems with a junior college, kindergarten through grade fourteen. In the larger school systems such consultants would need specialists under them for the elementary school, the secondary school, and the junior college.

Better articulation can also be promoted through state and regional groups such as the Southern California Industry Education Council, the various local sections of the American Chemical Society, and the California Academy of Science. College personnel, working with teachers of science and mathematics in the schools, can also greatly strengthen articulation.

Continuing Education of Teachers

The consultants endorse the recommendations on the preparation of secondary school teachers in science and mathematics made by the National Association of State Directors of Teacher Education and Certification and the American Association for the Advancement of Science in *Guidelines for Preparation Programs of Teachers of Secondary School Science and Mathematics.*[1]

A joint preparation responsibility must be developed on the part of the teacher, the school, and higher education in the state for the continuing education of the teacher. Adequate provision for continuing education should become one of the most important factors in the accreditation of schools. The state should plan with colleges to make it possible for teachers to take new courses in the subjects they teach, at intervals of no more than five years, and all teachers should take course work or be able to show the equivalent of study in science or mathematics during each five-year period.

A part of the in-service program for teachers should include the study of science laboratory and demonstration techniques. Such in-service study should give attention to the use of films, television, and programmed instruction, and should provide for group study programs, seminars, and visiting lecturers. It is extremely important that teachers be encouraged in every way to form the habit of regular study of the new science monographs. These will contribute to the development of teacher-scholars. Publications on science of the State Department of Education should be studied and discussed in school in-service programs on a regularly scheduled basis. The education of teachers can no longer be considered completed after five-year programs. The teacher must be a scholar the remainder of his life.

If the schools can move toward an 11-month academic year with pay, time off for study on the college campus or in groups in the school system will be available. The consultants recognize that if we have the kind of teachers we need for the future, school system budgets will need to be greatly increased. It is essential that teachers have financial support to maintain the rigorous program of study suggested in these recommendations.

In order to have a sound and up-to-date program of science education in grades nine through twelve, it is essential to have a supply of well-qualified teachers of science. Although California is in a quite favorable situation in the number of its in-service teachers and in its competitive position for recruiting new teachers, the quality of the preparation of teachers requires continued attention. If the recommendations for de-

[1] *Guidelines for Preparation Programs of Teachers of Secondary School Science and Mathematics.* Recommendations of the Teacher Preparation-Certification Study of the National Association of State Directors of Teacher Education and Certification and the American Association for the Advancement of Science with the support of the Carnegie Corporation of New York. Washington 5, D.C.: American Association for the Advancement of Science, 1962.

velopment of in-service programs and college courses for teachers and consultant services in the schools can be carried out the present supply of teachers will be more adequate.

In addition, it is recognized that many teachers would like to come to California, and that there probably would be little question of teacher supply if the present provision in the salary schedules, allowing credit for only five years of out-of-state teaching experience, could be removed. A principal deterrent to competent science teachers coming to California is the disadvantage in salary which results from lack of credit for teaching experience in another state.

The Committee should devise means for interesting more competent persons in teaching. A definition of school responsibilities of science teachers in terms of teaching load, maintenance of laboratory and equipment, and other school services would help to attract competent persons to teaching if such a definition were realistic in terms of current needs and demands.

It is strongly recommended that exceptionally competent teachers be assigned to the Track 2 program. These teachers may well need some special preparation for this work and certainly should receive added prestige for successful teaching in the Track 2 program.

Encouraging Independent Study by Students

School programs should be but the beginning of study on the part of students, and the study of science in formal courses should introduce ideas which students could pursue further on their own. Leadership in the world tomorrow will be taken by those who, while students, were interested and able to carry on, voluntarily, their studies and investigations. For secondary school students this means study after school hours. Schools can promote the development of these interests on the part of students by providing access to libraries during out-of-school hours and opportunities for laboratory work under supervision in the school. Local scientists and engineers are often available to help with these programs and are interested in doing so. Film, slide, and microfilm viewing rooms should be open after school hours. Educational television programs which can be seen at home or in the schools are helpful. Visits to museums and field trips should be attractive enough to recruit many volunteers in out-of-school hours. Guidance with home projects is desirable, and a teacher who undertakes these responsibilities should be given released time for it.

Authoritative and interesting paperback books in the sciences are now available from reputable publishers on a mass-distribution basis. Since many of these books have real interest for high school students, the school should make every effort to make them available. Science club programs make good contributions and can be further strengthened. Programmed courses in science will be available, and while these will

not provide for highly desirable laboratory experience, they may nevertheless be helpful, and should be carefully investigated. Schools should make careful investigation of all community educational resources for encouraging independent study on the part of students.

These recommendations for the encouragement of independent study are not made to extend the school day and school responsibility of young people, but rather in recognition of the very great importance for their future life work of the development of scholarly curiosity and attitudes of willingness to study on their own, to find answers to questions of importance in their work and everyday life.

One strong recommendation which came out of the April 17 discussion was that textbooks should be given to the students. Both in high school and college, for the students' development in science and increased independent study, textbooks can be a valuable asset.

Evaluation of Total Progress

In addition to the various programs of evaluation suggested for investigation by the Committee, it is recommended that the State Department of Education should begin considering the establishment of mechanisms for voluntary evaluation of the progress of students, teachers, schools, and the total state program. It is not proposed that such evaluation, at least at this time, be required. Evaluation on a broad scale would enable California schools to compare what they are doing with programs in other states and with their colleagues within California in terms of student accomplishment, resources available for the student, the quality of teacher preparation, continuing scholarship of the teachers, the total school program, and particularly, state efforts to improve science and mathematics instruction.

Conclusions

The consultants recognize that the recommendations contained in this document comprise a major order. They know, however, that the resources of California can provide for the achievement of these high goals. In so doing California will not only serve its own citizens but will also set a national example which can raise standards throughout the country. The recommendations involve many items which are expensive. It will therefore be necessary to sell the public on the importance of greater support for education in general and science education in particular. A school should not feel that it should not take steps to improve its program because it cannot reach all of the goals set forth in these recommendations. Each school can make a start. Each community, with state and national support, can achieve a much higher level of science education if the will is present.

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Dissenting Opinion

The following expression of dissent from certain portions of the report was made by Gairdner B. Moment on August 16, 1962:

". . . I think the report prepared by Dr. John Mayor on behalf of your consultants for science teaching in your schools is excellent. In my opinion its recommendations are sound both in general principles and in specific details. If it can be adopted and put into effect, it would give science teaching in California a tremendous thrust forward.

"There is one place, however, where I would like to enter a strong dissent even though I must admit that at the time I agreed with the opinions of my colleagues in math, physics, and chemistry. This dissent concerns the place of biology in the sequence of the sciences. Now that I am away from the influences of group suggestion I more or less feel that I must have been brainwashed, although in the most friendly way imaginable. The truth is that I have been firmly convinced for some years now that high school biology should be taught after high school chemistry. The common sequence which puts chemistry after biology was set up many years, in fact decades ago when the relationship between these sciences was very different from what it is now.

"The BSCS people have discussed this problem at length and have decided that the tradition of biology in the 10th grade is largely justified and would be extremely difficult to change in any case. Their answer to the problem of the new character of present-day biology is to improve the science taught in the ninth grade so that the students will enter the tenth with a real understanding of what a molecule is and what acidity or oxidation mean. Under the circumstances this is probably the best possible solution. But to place biology down in the ninth grade would only make matters worse.

"I hope that it will not be too confusing to have a dissenting voice on a single point in what is a very long report covering many aspects of science education. . . ."

BUSINESS EDUCATION ENROLLMENTS IN JUNIOR, SENIOR, AND FOUR-YEAR HIGH SCHOOLS OF CALIFORNIA IN 1961 WITH COMPARISONS FOR 1956

LELAND P. BALDWIN, *Assistant Chief, Bureau of Business Education*

The October Report of High School Principal takes the form of an enrollment survey every five years. During 1961, the most recent of these enrollment survey years, 472,616 enrollments were reported in business education subjects in California's public junior, senior, and four-year high schools.

Table 1 compares enrollments by subject areas for the last two enrollment survey years, 1956 and 1961, and shows the percent of increase or decrease. Table 1 shows that business education enrollments dropped from fourth to fifth position, and that the rate of increased enrollments in the vocational subject areas was smaller than in other subject areas. One possible reason for this may be that in the summer session programs, the largest enrollments have been in typewriting classes. Another possible reason for the comparatively smaller rate of increase in business subject enrollments could be the trend in some school districts to require additional courses for graduation.

TABLE 1

COMPARISON OF ENROLLMENTS IN BUSINESS EDUCATION COURSES BY SUBJECT AREA AND PERCENT OF INCREASE OR DECREASE 1956 to 1961

Rank		Subject area	Enrollments		Percent of increase or decrease
1961	1956		1961	1956	
1	1	English	1,218,689	523,443	132
2	2	Social studies	1,022,891	468,119	118
3	3	Mathematics	788,585	326,973	139
4	5	Science	540,086	270,771	99
5	4	Business education	472,616	320,772	49
6	6	Industrial arts	413,284	212,334	94
7	8	Homemaking	249,793	114,352	118
8	9	Art	231,280	92,913	149
9	7	Music	202,191	117,064	73
10	10	Agriculture	33,435	26,831	25
11	11	Trades and industries	4,990	7,405	—*48*

Table 2 shows that within the business subject area, the percent of increase in enrollments in certain courses was much greater than in other courses. The enrollments in advanced general business, recordkeeping, stenographic office practice, retail merchandising, business law, and

TABLE 2

COMPARISON OF ENROLLMENTS IN BUSINESS EDUCATION COURSES BY PERCENT OF INCREASE OR DECREASE 1956 to 1961

Rank		Course	Enrollments		Percent of increase or decrease
1961	1956		1961	1956	
1	1	Typing, first year	175,925	116,082	52
2	2	General Business	49,613	36,338	36
3	3	Typing, second year	43,857	31,783	38
4	4	Bookkeeping, first year	37,373	26,077	43
5	5	Shorthand, first year	28,469	22,115	29
6	6	In-school Business Work Experience	18,463	12,065	53
7	8	Office Machines	17,019	9,596	77
8	7	Office Practice, Clerical	16,429	11,059	49
9	10	Business Mathematics	11,993	7,672	56
10	9	Business English	10,057	9,393	7
11	18	Recordkeeping	8,897	2,918	206
12	13	Business Law	8,355	3,665	128
13	11	Shorthand, second year	7,997	5,992	34
14	16	Office Practice, Stenographic	7,352	3,102	137
15	12	Salesmanship	5,169	3,777	37
16	14	Business Work Experience, (not coordinated)	4,093	3,152	30
17	15	Bookkeeping, second year	3,974	3,138	27
18	17	Dictation-Transcription	3,516	2,953	19
19	20	Retail Merchandising	3,382	1,455	132
20	23	General Business, Advanced	3,263	976	234
21	21	Consumer Economics	2,895	1,321	119
22	22	Cooperative, Distributive Work Experience	1,239	1,087	14
23	--	Business Economics	960	--	--
24	--	Notehand and Briefhand	719	--	--
25	19	Cooperative Office Training	479	1,540	*—221*
26	--	Advertising	259	--	--
27	24	Economic Geography	135	523	*—288*
		Miscellaneous	734	2,993	--

consumer economics had increased over 100 percent. Enrollments in economic geography courses have shown consistent losses over the years. The loss in enrollments in cooperative office training reversed the usual trend.

The junior, senior, and four-year high school enrollments do not reflect any change in the relative positions of the "big four"—typewriting, general business, bookkeeping, and shorthand. The most significant enrollment increase was in recordkeeping, which moved from the eighteenth to the eleventh rank. This increase and the consistent increases in enrollments in office machines classes over the years reflect the emphasis and demand for skilled clerical workers.

Many business teachers have been working with the Northern California Council on Economic Education and the Southern California Council on Economic Education and attending summer session workshops on economic education. There were 960 enrollments in 1961 in business economics classes, an area in which enrollments had been negligible in previous years.

For the first time, classes in "Notehand" and "Briefhand," both shorthand systems which have been introduced since the last enrollment survey, were reported with 719 enrollments in 1961.

In general there was a small decrease from 1956 to 1961 in the percent of enrollments in second-year or two-year courses—from 12 to 10 percent in bookkeeping, from 27 to 25 percent in typewriting. Enrollments in shorthand courses by students continuing past the first year remained constant at 40 percent for both 1956 and 1961.

It is important to business teachers, counselors, and school administrators to observe trends in business education enrollments because the business world is experiencing an increased demand for highly skilled and technical workers. Vocational training programs in schools must keep abreast of these changing demands, and trends in business education enrollments must be constantly evaluated in terms of these demands for business training in the public schools.

Departmental Communications

OFFICE OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION

ROY E. SIMPSON, ***Superintendent***

APPOINTMENTS TO STAFF

MRS. JULIA GONSALVES was appointed NDEA Foreign Language Consultant June 18, 1962, to assist in developing a program of modern foreign language study at the elementary school level. Since 1960, Mrs. Gonsalves has been Curriculum Coordinator for the San Juan Unified School District, Carmichael, California, and from 1958 to 1960, she served in the same capacity for the Orangevale School District in Orangevale, California. She was general supervisor of instruction for the Office of the Placer County Superintendent of Schools from 1953 to 1958; and from 1950 to 1953 she was an assistant principal in the Pittsburg Unified School District, Pittsburg, California. Mrs. Gonsalves received her bachelor of arts degree from Pembroke College, Providence, Rhode Island, and her master of arts degree from Sacramento State College.

THOMAS A. DORAN was appointed NDEA Foreign Language Consultant, assigned to the Bureau of Secondary Education, August 31, 1962. Dr. Doran has been Chairman of the Foreign Language Department of the Folsom Unified School District for the past year. He came to California from Phoenix, Arizona, where he had served from 1957 to 1961 as Chairman of the Foreign Language Department for Arcadia High School, and from 1954 to 1957 as foreign language teacher in Scottsville High School. He received his bachelor of arts degree from Regis College, Denver, Colorado, and his doctor of philosophy degree from Gregorian University in Rome. Dr. Doran is a veteran of World War II.

FRED M. HANSON was appointed Consultant in the Education of the Mentally Retarded, Bureau of Special Education, September 19, 1962. Just prior to his acceptance of this position with the Department, Mr. Hanson was Coordinator of Special Education for the Redondo Beach Elementary School District in a cooperative project with the Hermosa Beach and Manhattan Beach elementary school districts and the Palos Verdes Peninsula Unified School District. From 1959 to 1962 he was Consultant in Special Education and School Psychologist for the Office

of the Imperial County Superintendent of Schools. He received his bachelor of arts degree and master of arts degree from Long Beach State College, and he has done post graduate work at Long Beach State College, the University of the Pacific, and the University of Southern California.

REGULATIONS ADOPTED BY SUPERINTENDENT OF PUBLIC INSTRUCTION

Allowances for Pupil Transportation. The Superintendent of Public Instruction, acting under the authority of and implementing Section 18054 of the Education Code, amended Section 1295 of Title 5 of the California Administrative Code, relating to allowances for pupil transportation, to read as follows (effective September 28, 1962):

1295. *Excessive Expenditures.* As a basis for determining expenditures upon which allowances shall be computed, 16 classes of school districts are hereby established, such classification being based upon the average size, measured by the number or rows of seats, of school busses operated, and the average number of hours per day school busses are operated, by and for school districts in transporting pupils between their homes and schools attended by them. The average number of hours per day school busses are operated shall be the hours accumulated between the time when the first pupil is loaded and the last pupil is unloaded for each trip each day divided by the total number of days busses are operated during the regular school term. The 16 classes are as shown in the following schedule, wherein capital letters indicate the average number of hours of bus operation per day, and Roman numerals indicate the average size of busses so operated:

	Average hours of bus operation per day			
	A	B	C	D
Average size of busses in number of rows	Less than 4 hours	4-5 hours	6-7 hours	8 or more hours
I. Less than 7 rows	A-I	B-I	C-I	D-I
II. 7-8 rows	A-II	B-II	C-II	D-II
III. 9-10 rows	A-III	B-III	C-III	D-III
IV. 11 or more rows	A-IV	B-IV	C-IV	D-IV

For each of the 16 classes of districts the Superintendent of Public Instruction shall annually ascertain the median of the average cost per bus per day for each district weighted by the number of vehicles operated by each district for all districts requesting allowances in their then current "Annual Report of Transportation Expense."

Vehicles used exclusively for transporting physically handicapped and severely mentally retarded pupils to and from special day classes and for which the district is eligible to receive an allowance under the provisions of Section 18060 of the Education Code, shall not be considered "school busses" for the purposes of this article.

Except as in this paragraph provided, the Superintendent of Public Instruction shall not compute allowances upon expenditures of a district for which the average cost per bus per day for the class of district to which the district belongs exceeds 125 percent of the median determined in this section. In any instance in which the Superintendent of Public Instruction determines that expenditures which exceed such percentage were caused by necessary replacement of the engine, or a necessary major overhaul, of one or more school busses, expenditures so caused may be allowed in addition to the aforesaid percentage.

For Your Information

STATE BOARD OF EDUCATION ACTIONS

The following actions were taken by the State Board of Education at its regular meeting held in Los Angeles, September 13-15, 1962.

Approval of Proposals for School District Organization

In accordance with the provisions of Chapter 9 of Division 5 of the Education Code (Sections 3151 and 3584), the Board approved the following proposals regarding changes in school district organization:

Formation of a unified school district in Alameda County—A proposal by the Alameda County Committee on School District Organization that an election be held to determine whether the voters in the territory comprising the Livermore Joint Union High School District wish to form a unified school district.

Formation of a unified school district in Fresno County—A proposal by the Fresno County Committee on School District Organization that an election be held to determine whether the voters in the territory comprising the Fowler Union High School District wish to form a unified school district.

Formation of a unified school district in Riverside County—A proposal by the Riverside County Committee on School District Organization that an election be held to determine whether the voters in the territory comprising the Hemet Union High School District wish to form a unified school district.

Revocation of Credentials for Public School Service

On September 15, 1962, by authority of Education Code Section 13202, the Board revoked the credentials, life diplomas, and other documents for public school service heretofore issued to Richard D. Acosta (birth date 4-3-25), and to John Moorman Carnahan (birth date 5-5-08).

ADMINISTRATIVE CALENDAR FOR NDEA PROJECTS FILED WITH THE CALIFORNIA STATE DEPARTMENT OF EDUCATION

J. Graham Sullivan, Chief of the Bureau of National Defense Education Act Administration of the California State Department of Education, has announced the following administrative calendar for projects filed with the Department under Titles III, V, and VIII of the National Defense Education Act:

TITLE III

Deadline for filing applications for 1963-64 federal funds—April 15, 1963

Project applications must be postmarked or delivered on or before this date.

Applications for Title III-A projects (equipment acquisition) and Title III-B projects (special consultant services) should be mailed separately.

Project evaluations—May 6-11, 1963

District notification of approval of projects will begin June 1, 1963.

Final date for filing claims for reimbursement from 1961-62 federal funds—June 30, 1963

State warrants will be forwarded to offices of school districts or county superintendents of schools within 30 days of receipt of claims.

Final date for filing claims for reimbursement from 1962-63 federal funds—June 30, 1964

TITLE V

Deadline for filing applications for 1963-64 federal funds—March 1, 1963

Filing period—February 1 to March 1, 1963

Deadline for filing annual statistical and narrative reports of 1962-63 projects—June 3, 1963

Final date for filing fiscal reports and claims for reimbursement from 1962-63 federal funds—August 1, 1963

TITLE VIII

Applications are now being received and processed for 1962-63 federal funds.

Final date for filing claims for reimbursement from 1962-63 federal funds—August 1, 1963

Applications may be submitted for 1963-64 federal funds, but such applications cannot be processed before July 1, 1963.

GEOGRAPHIC SCHOOL BULLETINS IN COLOR

Beginning October 1, 1962, each of the 30 weekly issues of the *Geographic School Bulletin* will contain many pictures in color. New techniques of printing and color conversion make it possible for the National Geographic Society to offer this enlarged and improved format at no increase in subscription rates—$2.00 per school year in the United States, $2.25 in Canada, and $2.50 elsewhere. Subscribers in the United States may receive 90 issues (three full school years) for $5.00. Orders should be addressed to the School Service Division, National Geographic Society, Washington 6, D.C.

CALENDAR OF EDUCATIONAL MEETINGS AND EVENTS

A master calendar of educational meetings and events of statewide or regional significance is maintained in the Office of the Superintendent

of Public Instruction. The principal list of 1962-63 events appeared in the September, 1962 issue of *California Schools*. Notices and corrections that are not received at the time of publication of this list are published as they are received.

Date	*Organization and event*	*Place*
April 6-9, 1963	California Association for Health, Physical Education, and Recreation, Annual Conference	Lafayette Hotel, Long Beach
April 19-20, 1963	California Driver Education Association, State Convention	San Jose State College
May 3-4, 1963	California Council of Geography Teachers, Annual Meeting	San Diego State College

Professional Literature

PUBLICATIONS RECEIVED

Annotated Bibliography of Materials in Economic Education. Joint Council on Economic Education in cooperation with the University of Illinois Center for Economic Education. New York 36, N.Y.: Joint Council on Economic Education, 1962. Pp. iv + 48. $0.75.

Casebook on Campus Planning and Institutional Development. Ten Institutions: How They Did It. Compiled by JOHN B. RORK and LESLIE F. ROBBINS. OE-51003, Office of Education, Circular No. 667. Washington 25, D.C.: U.S. Department of Health, Education, and Welfare, 1962. Pp. vi + 162. $1.25.*

Educators Guide to Free Films: 22nd Annual Edition, 1962. Compiled and edited by MARY FOLEY HORKHEIMER and JOHN W. DIFFOR. Randolph, Wisconsin: Educators Progress Service, 1962. Pp. xiv + 646. $9.00.

HALL, OLIVE A. *Research Handbook for Home Economic Education.* Minneapolis 15, Minnesota: Burgess Publishing Co., 1962. Pp. vi + 168. $4.85.

JOHNS, EDWARD B.; SUTTON, WILFRED C.; WEBSTER, LLOYD E. *Health for Effective Living: A Basic Health Science Text for College Students, Third Edition.* New York 36, N.Y.: McGraw-Hill Book Co., Inc., 1962. Pp. xx + 540. $6.95.

JOHNSON, ARLIEN. *School Social Work: Its Contribution to Professional Education. Appendix of Eight Illustrative Case Records.* A study based in part on the material presented at the Conference on the Contribution of School Social Work to Social Work Education, Highland Park, Illinois, August 2-8, 1959, sponsored by the School Social Work Section, National Association of Social Workers, Inc., New York 16, N.Y.: National Association of Social Workers, Inc., 1962. Pp. 256. $4.50.

MARTORANA, S. V., and HOLLIS, ERNEST V. *Survey of State Legislation Relating to Higher Education, January 1, 1961 to December 31, 1961.* OE-50008-61, Circular No. 684, Office of Education. Washington 25, D.C.: U.S. Department of Health, Education, and Welfare, 1962. Pp. iv + 276. $1.75.

1962 Achievement Testing Program in Independent Schools and Supplementary Studies. Educational Records Bulletin No. 82, July, 1962. New York 32, N.Y.: Educational Records Bureau, 1962. Pp. xii + 76.

Proceedings of the 13th Annual State Conference on Educational Research. Held at Los Angeles, California, November 3-4, 1961. California Teachers Association Research Résumé No. 20, April, 1962. Burlingame, California: California Teachers Association, 1962. Pp. xiv + 66. $1.00.

Rankings of the States, 1961. Research Report 1961-R1 (January, 1961) of the Research Division of the National Education Association. Washington 6, D.C.: National Education Association, 1961. Pp. 44.

What We Teach: A Review of Curriculum Developments, 1960-1961. Annual Report of the Superintendent of Schools, 1960-1961. Prepared by the Division of Curriculum Development. Brooklyn 1, New York: Board of Education of the City of New York, 1962. Pp. viii + 124.

* For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

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